

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Moving Stairways

We, WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY, of 40, Wall Street, New York, State of New York, United States of America, a corporation organised and existing under the Laws of the State of Delaware, in said United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates generally to moving stairways, and more particularly, to the operation of the stairway steps along their tracks.

In moving stairways as heretofore constructed, the steps have been supported upon their tracks by front rollers and by rear rollers, and have been moved along their tracks by driving chains which pass around driving sprocket wheels at the ends of the stairways. The steps are fastened to the chains by passing the front axles through the roller joints in the chains. In order to keep the amount of sagging of the chains between the steps as low as possible, they are kept under tension by means of suitable tensioning mechanism connecting the lower sprocket wheels to the lower end of the stairway frame.

It is also customary to provide suitable guide rails above the step rollers to limit the degree to which they may leave their track rails and to avoid objectionable tilting of the steps. In constructing the stairway, the guide rails and the track rails are mounted in position with a minimum amount of clearance between them for the step rollers. However, where the steps leave the lower landing and curve toward the straight rise portion of the stairway extending to the upper landing, the tension on the chains tends to cause them to raise the front axles of the steps, thus moving the rollers thereon upwardly from their track rails into engagement with their guide rails.

When the steps are new, the clearance between the track rails and the guide rails may be so small that the free play of the rollers therebetween will not be noticeable. However, as the steps continue in

operation, the step rollers wear from their normal full size to a smaller size and hence the amount of clearance between them and the rails becomes greater. If the wear becomes excessive, there is a tendency for the steps to increase their float or tilt and operate in an unpleasant manner as they move along the tracks. Heretofore the only way to overcome this unpleasant kind of operation has been to replace the worn step rollers with new rollers.

The chief object of the present invention is to provide an improved moving stairway in which, regardless of wear, the steps will glide from one landing to another without tilting or deviating even slightly from the path along which they are designed to travel.

With the above object in view, the moving stairway, according to the present invention, comprises an endless series of movable steps, each of said steps being provided with rollers disposed for operation along a track and a biasing device or devices mounted on the stairway framework in such position as to engage the stairway operating chain and force it toward the track for maintaining the step rollers in engagement with the track.

In order that the invention may be more clearly understood and readily carried into effect, reference will now be made to the accompanying drawings in which:

Figure 1 is a diagrammatic representation of one side of a moving stairway embodying the present invention, as seen from the interior of the stairway;

Fig. 2 is an enlarged view, in side elevation, of the curved portion of the stairway leading from the lower landing to the straight rise portion of the stairway with the step biasing means of the present invention embodied therein;

Fig. 3 is a view in side elevation of a portion of the left-hand end of Fig. 2, with parts of the sprocket chain and the steps broken away to permit illustration of the biasing means, and

Fig. 4 is a view in cross-section of the front axle, driving chain, and front rollers of a step with the biasing means

on each side disposed in engagement with the chain rollers.

Referring more particularly to the drawings, a moving stairway is illustrated as comprising an endless series of movable steps 11 disposed to be moved along a track 12 by a pair of sprocket chains 13 and 14 between an upper landing 15 and a lower landing 16. The sprocket chains are supported at the upper landing by a pair of driving sprocket wheels 17, and at the lower landing by a pair of tensioning sprocket wheels 18. A tension device 19 is illustrated as being attached to the axle 20 of the lower sprocket wheels 18 to bias the tensioning sprocket wheels to the right to maintain the sprocket chains under a suitable tension at all times.

Each of the chains comprises a plurality of outer links 23 and 24 and a plurality of inner links 25 and 26 connected at each joint by a cross pin 27. A chain roller 28 is rotatably mounted upon each cross pin for the purpose of engaging the sprocket teeth as the chain operates over the sprocket wheels. Each roller 28 is provided with a central peripheral channel 29 and side flanges 30 and 31 to cause it to seat securely on the sprocket wheels. A front axle 32 and a pair of rear stub axles 32a are mounted on each step. The ends of the front axle extend through bushings 27a in adjacent joints in the chains so that the steps will move along their tracks with the movement of the chains.

Each step is supported on its track by a pair of front wheels or rollers 33 and 34 (Fig. 4) mounted on the outer ends of its front axle 32 and a pair of trailing wheels or rollers 35 mounted on its rear stub axles 32a. In moving on the upper track from the lower landing to the upper landing, the front roller 34 travels on a track rail 36 comprising an angle iron suitably mounted upon a channel iron 37. The front roller 33 is likewise provided with a track rail 38 mounted upon the channel bar 39. The trailing rollers 35 run on a track rail 35a.

A plurality of horizontally mounted rollers 40 are disposed on the channel members 37 and 39 by means of supporting bases 41 in position to engage the inner surfaces of the front step rollers and thereby prevent the steps from moving laterally while they travel along the track.

A guide rail 44 is mounted above the roller 34 on a member of the stairway framework 45 for the purpose of preventing the roller from leaving the track rail 36. When the stairway is constructed, the guide rail 44 is disposed very close to the roller 34, particularly at the point in

the stairway where the steps leave the lower landing and curve upwardly toward the upper landing in order to prevent the tensioning of the chains from pulling the front end of the step upwardly. However, the clearance between the guide rail 44 and the step roller 34 must be sufficient to permit the roller to travel along its track rail 36 without rubbing against the guide rail. A similar guide rail 44a is provided for the front roller 33.

When the stairway is new and clearance between the guide rails and the rollers 33 and 34 is very small there will be only a slight free play of the rollers between their track rails and their guide rails, the amount of this free play being so small as to be not very objectionable. However, it has been found in practice that the rollers wear to a smaller diameter and thereby increase the clearance between themselves and the guide rails to such an extent that an objectionable movement of the rollers 33 and 34 between the track rails and the guide rails may occur, particularly at the point where the stairway curves upwardly from the lower landing toward the upper landing.

In order to avoid this difficulty, means are provided for biasing the front rollers 33 and 34 of the steps toward their track rails while they are moving along the curved section of the track leading to the upper landing. The biasing means comprises a pair of flexible biasing cam members each consisting of flexible strips 47 and 48. The flexible strips 47 are disposed to engage the channel portions 29 of the rollers 28 on the chain joints as the chains pass along the curved portion of the stairway leading upward from the lower landing to the straight rise portion of the stairway. The strips 47 may be constructed of any suitable material, such as a textile material impregnated with a phenolic condensation product capable of hardening under heat and pressure such as a material sold under the Registered Trade Mark "Micarta", which will provide an effective wearing and quiet surface for engaging the chain rollers. The flexible strips 47 are each mounted upon a flexible strip of steel or other suitable material 48, backed up by a resilient means such as a plurality of coil compression springs 49 which bias the strips 47 into engagement with the chain rollers 28. The compression springs may be mounted on suitable spring seats 50 in position to rest against the under face of the framework 45. The flexible biasing cam member is anchored at its upper end by a suitable spring 51, one end of which is attached to the frame member 45 and the other end of which is attached to the

front end of the cam member, to prevent undue longitudinal motion and to cause the member to maintain its longitudinal position while the chain rollers pass under it.

Inasmuch as the springs 49 press the biasing cam members downwardly on the chain rollers as the steps pass along the portion of the track to which the cam members are attached, it will be seen that they press the front rollers 33 and 34 of the steps downwardly and firmly against their track rails 36 and 38, regardless of the upward pull the chains may exert upon the axle 32 by reason of the amount of tension in the chains. This prevents any binding on the rollers or the steps because the front rollers 33 and 34 rotate freely along their track rails 36 and 38 while the chain rollers 28 are free to rotate in the opposite direction as they travel along under the biasing cam members. Inasmuch as the front rollers 33 and 34 are pressed firmly against their track rails, there will be no tendency for the front end of the step to float between its track rails and its guide rails, regardless of how much wear may occur in the rollers 33 and 34. The trailing rollers 35 on the nose end of the step will, by reason of gravity, follow along their track rails 35a and hence the step will travel from the lower landing to the upper landing firmly along its track rails, regardless of the weight or distribution of the passengers on the stairway.

The strength of the biasing springs 49 and the stiffness of the biasing cam members should be so selected that they will hold the front step rollers 33 and 34 firmly enough on their tracks to prevent teetering or tilting of the steps when occupied by passengers and yet not so firmly as to cause any undue wear in the axles, rollers and cam members as the steps move along their runway.

From the foregoing construction it will be seen that the force exerted by the flexible biasing cam members bearing on the chain rollers as the steps pass along the upwardly curving portion of the stairway will press the front step rollers 33 and 34 against their track rails, thus preventing the steps from floating between their track rails and guide rails while they are in the upwardly curving zone and thus eliminating any undesirable motion of the steps.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A moving stairway comprising an endless series of movable steps, each of

said steps being provided with rollers disposed for operation along a track and a biasing device or devices mounted on the stairway framework in such position as to engage the stairway operating chain and force it toward the track for maintaining the step rollers in engagement with the track.

2. A moving stairway comprising an endless series of movable steps, each of said steps being provided with track rollers disposed for operation along a track, chain means attached to said steps and having rollers for engagement with sprocket wheels for driving said stairway and resilient means for engaging the said chain rollers to bias the step track rollers against the track.

3. A moving stairway as claimed in claim 1, wherein the said biasing device or each of said devices comprises a cam member, and spring members or the like positioned between said member and the framework.

4. A moving stairway as claimed in claim 1 or 3, wherein said cam member is flexible.

5. A moving stairway comprising an endless series of movable steps connecting a lower landing with an upper landing each of said steps being provided with track rollers and being disposed for operation along a track by means of a chain attached to the axles of each of said steps, a cam member or members secured to a portion of the stairway framework through the intermediary of spring members or the like and adapted to provide a cushioned pressure against the rollers of said chain as they pass along such portion of the track for maintaining the track rollers in engagement with that portion of the track.

6. A moving stairway comprising an endless series of steps connecting a lower landing with an upper landing, each of said steps being provided with track rollers and being disposed for operation along a track by means of a pair of chains attached to the axles of each of said steps, said chains passing over sprocket wheels mounted at each of said landings, a roller on each joint in the chains for facilitating their operation on the sprocket wheels, mechanism for maintaining the chains under tension to prevent sagging between the steps, a resiliently mounted cam member or members mounted on the stairway framework above a curved portion of the track in position to engage the rollers on the chain and bias them toward said curved portion of the track for maintaining the track rollers in engagement with the track where it curves from a lower landing towards a straight rise to the

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upper landing.

7. A moving stairway as claimed in any of the preceding claims 3 to 6, wherein the said cam member or each of said cam members include a wearing surface formed of a textile material impregnated with a phenolic condensation product capable of hardening under heat and pressure.
- 10 8. In or for a moving stairway a step biasing device substantially as herein-

before described with reference to the accompanying drawings.

9. A moving stairway substantially as hereinbefore described with reference to 15 the accompanying drawings.

Dated the 12th day of June, 1941.

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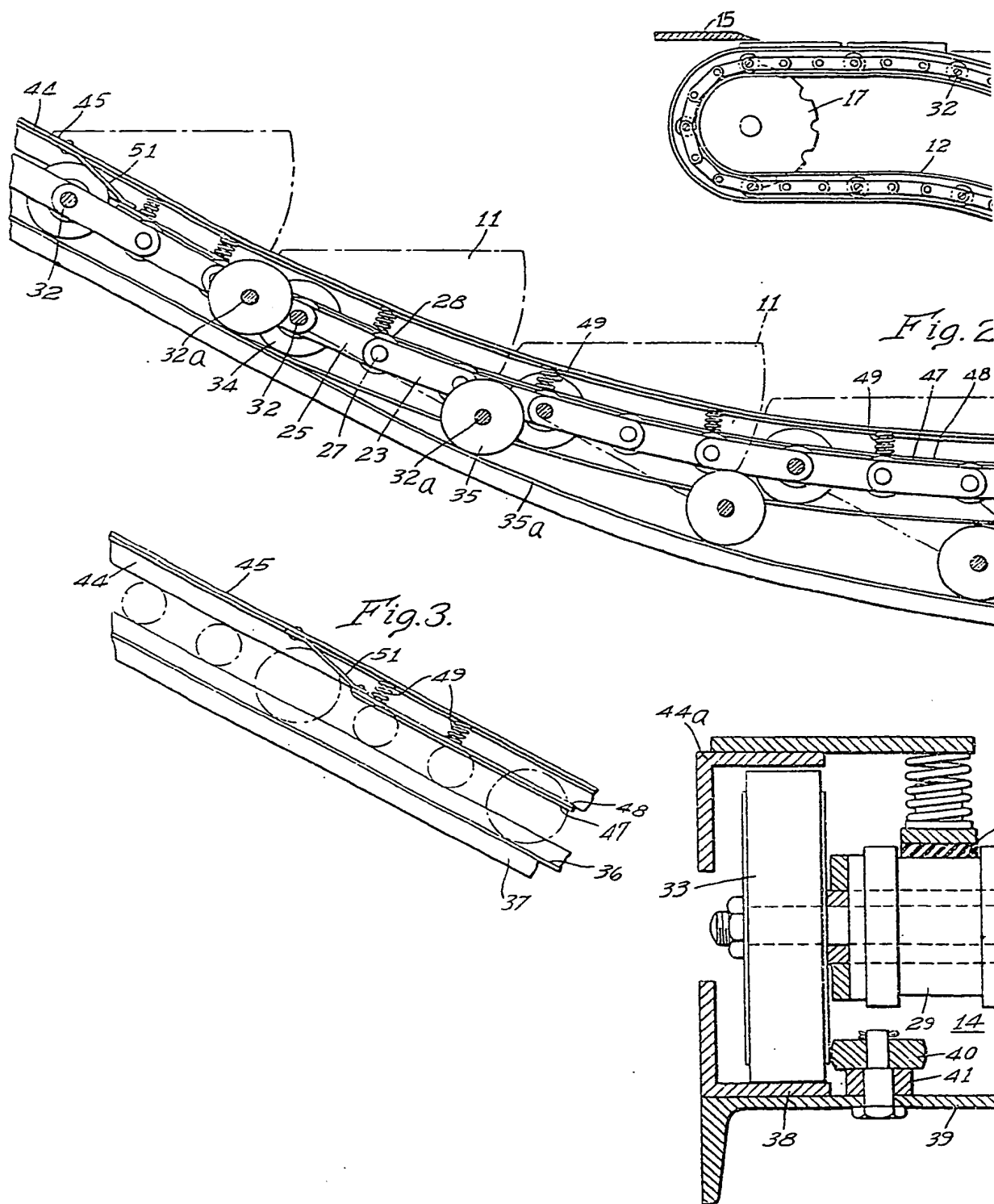
W.C.2.

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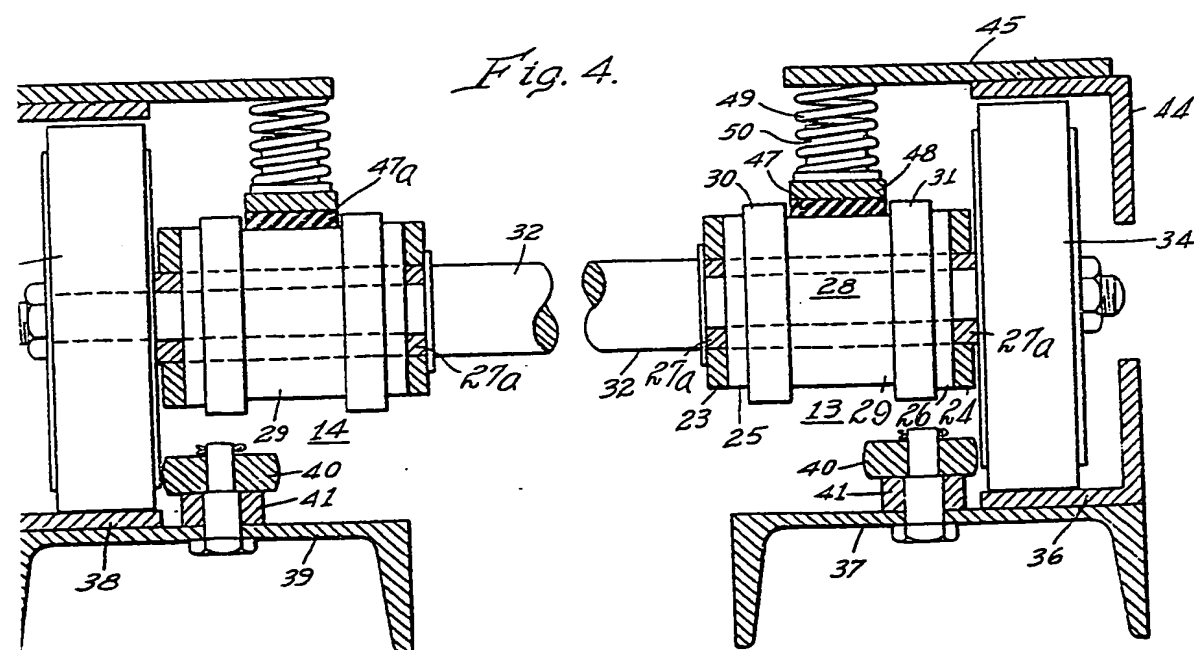
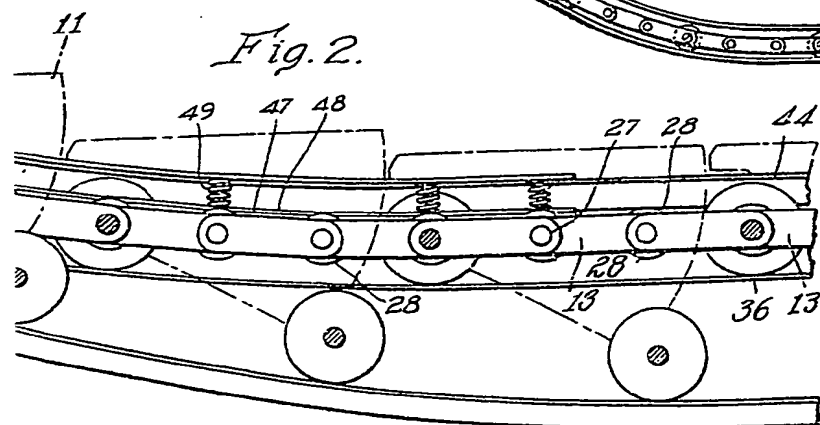
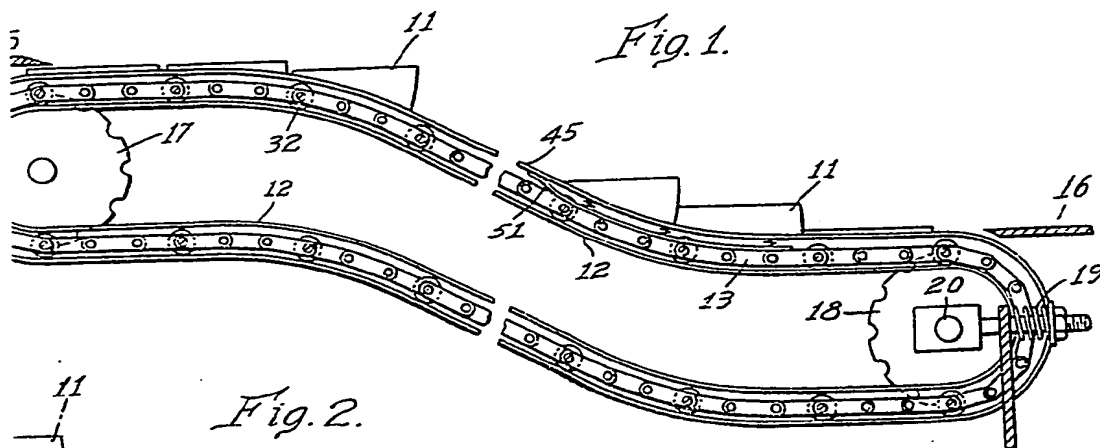
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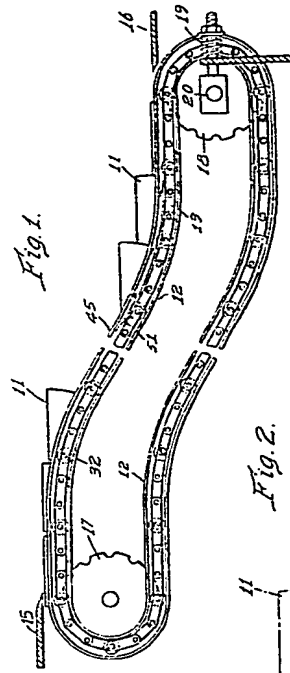


Fig. 1.

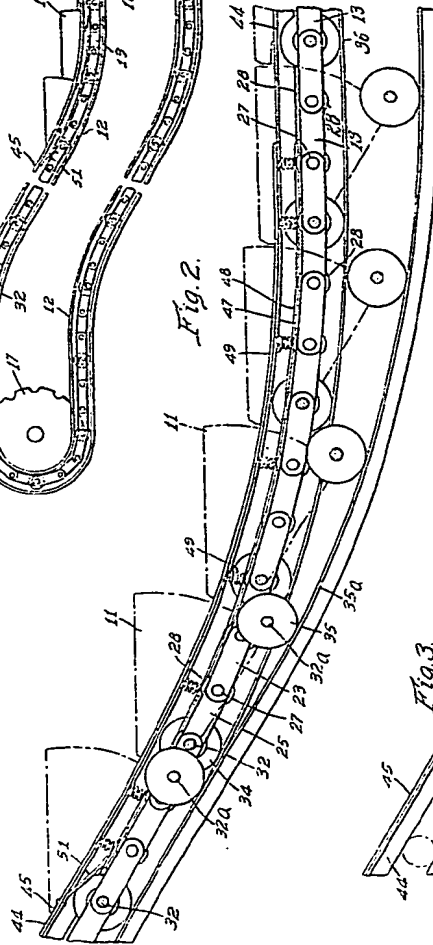


Fig. 2.

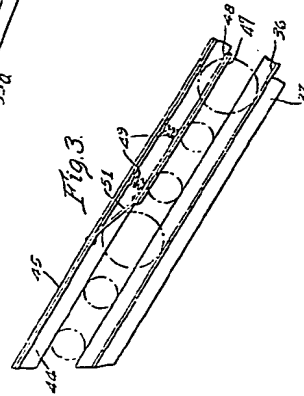


Fig. 3.

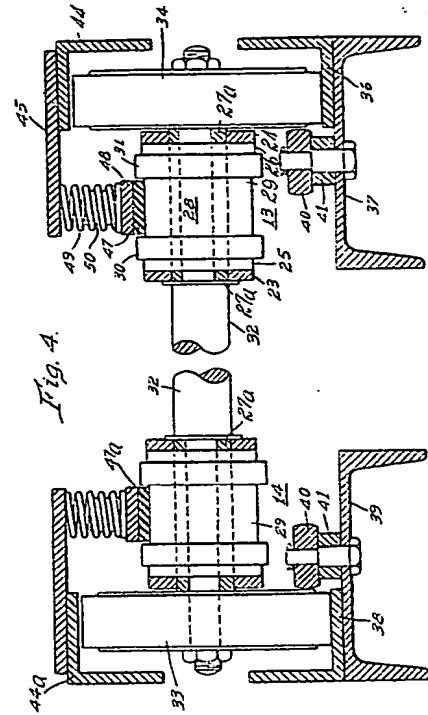


Fig. 4.

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